The use of cluster tools in semiconductor wafer processing is well known. Examples include the CENTURA® and ENDURA® platforms available from Applied Materials, Inc., located in Santa Clara, California. An example of a typical cluster tool 100 is shown in Figure 1. Cluster tools generally include mounting a plurality of process chambers 104 to a transfer chamber 102. The transfer chamber 102 houses a centrally located robot 120 which communicates with the process chambers 104 through slit valves (not shown). Current practice includes the use of load locks 108 as intermediary chambers between pod loaders 115-118, a plurality of mini-environments 114, and the transfer chamber 102. The load lock 108 is continuously alternated between ambient pressure when communicating with pod loaders 115-118 and a vacuumed condition when communicating with the transfer chamber 102.

D1

Please replace the paragraph at page 9, lines 1-9, with the following paragraph:

A first end of the first strut 358 is pivotally connected to the blade 262 at a first wrist joint 370, while a first end of the second strut 358' is pivotally connected to the blade 262 at a second wrist joint 370'. The first and second wrist joints 370, 370' define a leading axis C. Similarly, the first and second pivot joints 372, 372' define a lagging axis D. A ramped backstop 271 biases the blade 262 toward the aperture 248 such that axis C leads axis D by a short distance (a few millimeters). The backstop 271 ensures that axis C and axis D retain their relationship and that the blade 262 is always moved outward upon counterclockwise rotation of the first drive arm 354 and inward upon clockwise rotation of the first drive arm 354.

D2

Please replace the paragraph at page 9, lines 10-17, with the following paragraph:

In the retracted position of the transfer robot 204, the first and second drive arms 354, 354' and first and second struts 358, 358' rest along the chamber wall 210 such that a central portion of the chamber cavity 201, having a diameter approximately equal

to the wafer 250, is occupied only by the blade 262. In a fully extended position, a phantom transfer robot 204' shows the central portion of the chamber cavity 201 unoccupied. In this position, a wafer may be vertically transferred above and below the transfer plane within the central portion of the chamber cavity 201 by the lifting mechanism 232.

D2

Please replace the paragraph at page 9, lines 28-30, and at page 10, lines 1-26, with the following paragraph:

D3

Figures 4a-4d show a wafer transfer within the present invention. Initially, an atmospheric robot blade 285 positions a wafer 250 between the raised lid 216 and the cover 206, and over the blade 262 as shown in Figure 4a. In order to receive the wafer 250, the lifting mechanism 232 raises the pins 234 above the atmospheric robot blade 285 while the atmospheric robot blade 285 withdraws from above the chamber body 202 as shown in Figure 4b. Figure 4c shows the lifting mechanism 232 lowering the pins 234 until the wafer 250 is deposited on the blade 262. The support pins 234 then continue to retract below the transfer plane B. Simultaneously, the lid 216 is lowered onto the cover 206 causing the first seating surface 214 and the second seating surface 218 to sealingly engage (shown in Figure 4c). The vacuum pump 251 (shown in Figure 2) then pumps the chamber cavity 201 down to a pressure substantially equal to the base pressure of the process chamber 249 (also shown in Figure 2). Once a transfer pressure is reached, the sealing door 256 is opened to provide fluid communication between the process chamber 249 and the load lock chamber 200. As shown in Figure 4d, the blade 262 is then extended into the process chamber 249 to deliver the wafer 250 above the wafer support member 247 (shown in Figure 2) where a lift mechanism (not shown) can position the wafer 250 onto the wafer support member 247 for processing. After delivering the wafer 250 into the process chamber 249, the blade 262 is retracted and the sealing door 256 is closed. The process chamber 249 is then pumped down to its base pressure and the wafer 250 undergoes processing. Upon completion of the processing step, the steps described above are performed in reverse. Specifically, the sealing door 256 is opened and the blade 262 is extended into the

D3 process chamber 249 to retrieve the wafer 250. The blade 262, carrying the wafer 250, is retracted and the sealing door 256 is closed. The chamber cavity 201 is then pumped up to ambient pressure. The actuating mechanism 222 raises the lid 216 while the lifting mechanism 232 raises the pins 234 and, consequently, the wafer 250, above the transfer plane of the atmospheric robot blade 285. The atmospheric robot blade 285 is then extended beneath the wafer 250 and the lifting mechanism 232 lowers the pins 234 leaving the wafer 250 on the atmospheric robot blade 285.

Please replace the paragraph at page 11, lines 6-15, with the following paragraph:

D4 Figures 5-9 show a second embodiment of the present invention adapted to handle two wafers. The second embodiment generally comprises a multi-wafer transfer assembly. The transfer assembly includes a first pair of cooperating lift forks 420 coupled to a first Z-θ actuating assembly 460 (shown in Figures 6 and 9) and second pair of cooperating lift forks 422 coupled to a second Z-θ actuating assembly 462 (shown in Figure 6). As shown in Figure 6 the Z-θ actuating assemblies 460, 462 are mounted to the lid 216 to impart vertical (Z) and rotational (θ) motion to the lift forks 420, 422 respectively. The Z-θ actuating assemblies 460, 462 are discussed in detail below. A wafer support 424 is provided to support a wafer thereon below the transfer plane of internal robot 204.

Please replace the paragraph at page 14, lines 29-30, and page 15, lines 1-28, with the following paragraph:

D5 Upon completion of processing, the process chamber 249 is pumped up to a transfer pressure, the sealing door 256 is opened, as shown in Figure 10j, and the blade 262 is extended into the process chamber 249 to retrieve the first wafer 500. The blade 262, carrying the first wafer 500, is then retracted, as shown in Figure 10k, and the first pair of forks 420 is actuated toward the wafer 500. Upon breaching the transfer plane B, the lift elements 432 are rotated and positioned under the wafer 500 and the lift forks

420 are raised to a position above the transfer plane B to support the substrate as shown in Figure 10l. Subsequently, the blade 262 is again extended into the process chamber 249. While the blade 262 is parked in the process chamber 249, the first pair of forks 420 are lowered below the transfer plane B to position the wafer 500 onto the wafer support member 424 as shown in Figure 10m. In Figure 10n the lift elements 432 are rotated and raised to a position above the transfer plane B and the blade 262 is again retracted. Simultaneously, as shown in Figure 10o, the second pair of forks 422 is actuated toward the transfer plane B to position the second wafer 502 onto the blade 262. Once the wafer 502 is positioned on the blade 262, the second pair of forks 422 is rotated and actuated to a position above the transfer plane B. The blade 262 is then extended into the process chamber 249 carrying the wafer 502 as shown in Figure 10p. Simultaneously, the first pair of forks 420 is lowered to retrieve the wafer 500 from the wafer support 424, also shown in Figure 10p. Once the wafer 500 is raised above the transfer plane B, the blade 262 is retracted. Upon retraction of the blade 262, the sealing door 256 is closed and the process chamber 249 is pumped down to its base pressure for processing wafer 502. Simultaneously, the load lock 200 is pumped up to ambient pressure. In order to exchange the wafer 500 for another wafer, the lid 216 and both pairs of forks 420, 422 are raised as shown in Figure 10q. Figure 10q and 10r show the atmospheric robot blade 285 extended below the first wafer 500 at which point the first pair of forks 420 lowers the wafer 500 onto the atmospheric robot blade 285. The first pair of forks 420 is then rotated. The atmospheric robot blade 285 is retracted to dispose of the wafer 500 in the wafer cassette (not shown) and again extended carrying an unprocessed wafer which is positioned on the second pair of forks 422. The forks 420, 422 and lid 216 are then lowered and the steps are repeated.

B5

Please replace the paragraph at page 15, lines 29-30, and page 16, lines 1-15, with the following paragraph:

In another embodiment shown in Figure 11, the load lock 200 shown in Figure 2 is modified to include a solid cover 504 and a slit valve aperture 506 formed in the chamber wall 210 at the rear of the load lock 200 providing back-loading access for an

B6

atmospheric robot (not shown) to transfer wafers. A slit valve apparatus 510 located adjacent and behind the load lock 200 is selectively activated to seal the load lock chamber 200. The slit valve apparatus 510 generally comprises an elongated door 512 coupled to an actuator 514 to move the door 512. An o-ring 516 is disposed on a sealing surface of the door 512 to hermetically seal the load lock 200. The slit valve apparatus 510 may be any commercially available slit valve apparatus such as the one disclosed in U.S. Patent No. 5,2226,623 assigned to Applied Material, Inc., of Santa Clara, California, which is incorporated by reference herein. Alternatively, any other sealing apparatus, such as a gate valve, may be used to advantage. In operation, the door 512 is opened and an external robot blade (not shown) delivers a wafer (not shown) into the chamber cavity 201. The lifting mechanism 232 (shown with the lift pins 234 in a lowered position) is raised to receive the wafer. The lift pins 234 are then lowered to deposit the wafer onto the transfer robot 204 while the external robot blade is retracted and the door 512 is sealed.

D6

Please replace the paragraph at page 16, lines 16-27, with the following paragraph:

In each embodiment disclosed above, a shield, or cover 264 (shown in Figure 2), may be employed to surround the load lock 200 and define a clean environment 267 about the load lock 200. The cover 264 provides protection from particles which might otherwise migrate into the chamber body 202 and deposit themselves on a wafer. Such particles can lodge within interconnect features of semiconductor wafers resulting in defective devices. A filtration system 268 (shown schematically) operates to maintain the clean environment 267. A loading aperture 266, which is selectively opened and closed by a sealing apparatus (not shown), provides access for an external robot blade (not shown). The external robot blade is preferably located in an adjacent clean room (multiple embodiments of which are described below with respect to Figures 12 and 13) adjacent and behind the load lock 200. Other embodiments designed to shield the load lock 200 from contamination are discussed below.

D7